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Providing Information on Climate Variability for the U.S.-Affiliated Pacific Islands

http://www.prh.noaa.gov/peac

CURRENT CONDITIONS

The climate of the Pacific basin began 2012 in La Niña, which then quickly evolved to ENSO-neutral. By late spring, after the typical predictive barrier for ENSO forecasting, it was thought that a transition to El Niño would occur sometime in the latter half of 2012, with El Niño most likely to become established during the Northern Hemisphere fall months. An El Niño alert was put in-place by the CPC. During the summer of 2012, the ocean began to show signs of El Niño with observed warming of the equatorial SST and sub-surface waters. The atmosphere, however, showed few signs of impending El Niño. The monsoon was weak or absent at low latitudes (e.g., throughout most of Micronesia) and tropical cyclone activity occurred mostly to the west and north of average. Sea levels remained near or just below their 2011 La Niña high stands across Micronesia, which is not typical of the onset of El Niño. By mid-October of 2012, the western North Pacific monsoon retreated early, trade winds became firmly established across most of Micronesia, and tropical cyclone activity slowed (with Super Typhoon Bopha a notable hold-out). The evolution of the Pacific climate system through the Northern Hemisphere fall of 2012 was decidedly not El Niño, and indeed, all indexes of ENSO moved to well within the boundaries of ENSO-neutral. In December 2012 and continuing into recent weeks, some of the islands of the RMI became persistently dry. The Guam Weather Forecast Office and the Majuro (RMI) local weather office issued special drought statements for these atolls. See the local variability summaries for more details on this.

Weather patterns across Micronesia are typically binned into El Niño or La Niña in order to establish the extremes typically associated with each. Weather patterns during ENSO-neutral are often thought to be within the bounds of "near average". El Niño is typically associated with the most serious disruption to weather patterns (e.g., widespread severe drought, and a sharp increase in the occurrence of typhoons). Non-El Niño years, however, do have a smaller but important share of climatic extremes (e.g., the massive ocean swell and inundations seen across the region in December 2008). Least studied have been the typical climatic conditions during ENSO-neutral (if there are such), and certainly more research is warranted for this climate regime.

For the past decade, ENSO behavior has shifted to become more dominated by La Niña. The observed El Niño's (e.g., 2002, 2004, 2006, 2009, and the attempted El Niño of 2012) were weak, or they fall into the modoki variety of El Niño, where the maximum equatorial sea surface temperatures are near the date line instead of in the eastern or central Pacific. The last strong El Niño occurred in 1997-98, after which time surface easterly wind flow became abruptly and persistently strong (i.e., more like La Niña like). These strong easterly winds have caused the sea level to remain very high across Micronesia since 1998. During 2010, for example, the strength of the low-level easterly wind in the central equatorial Pacific was the highest in the CPC archived record. The dominance of easterly winds over the past decade have weakened the summer monsoon, and profoundly affected the distribution of typhoons; keeping them to the west and north of Micronesia.

In summary, the climate of the western North Pacific basin during 2012 included a slight reduction of tropical cyclones in the basin, a substantial reduction of tropical cyclones across the Micronesia region (notwithstanding Super Typhoon Bopha), a weaker-than-normal monsoon trough in Micronesia, and an early retreat of the summer monsoon. Average to above-average annual rainfall was recorded at most sites, with the only persistent dryness seen in the RMI (see Figures 1a and 1b). Very heavy rainfall occurred at Kapingamarangi, where the 2012 total of 171.33 inches was 156% of normal. In American Samoa, the 2012 rainfall was near average. During December of 2012, the Australian northwest monsoon pushed eastward along the South Pacific Convergence Zone (SPCZ) and led to an early and active start to the hurricane season of the South Pacific. Cyclone Evan (RSMC Nadi designation: 04F, JTWC designation: 04P) moved eastward and almost reached American Samoa before it made a complete U-turn on a track back toward Fiji. Cyclone Evan was the worst tropical cyclone to affect the island nation of Samoa since Cyclone Val in 1991 (see Tropical Cyclone section). The northwest monsoon has remained active in the region of Fiji, Tonga, and American Samoa through January of 2013, with additional tropical cyclone activity noted (e.g., Cyclone Garry).

Several heavy rain events in January brought varying levels of drought relief to all four counties across the state of Hawaii. For some locations, it was the wettest January in at least five years. The entire island of Kauai is now considered to be drought free. However, extreme drought conditions persist in portions of Maui and the Big Island.

SEA SURFACE TEMPERATURES

During January 2013, ENSO-neutral continued, although below-average sea surface temperatures (SST) prevailed across the eastern half of the equatorial Pacific. While remaining below average, a high degree of variability in the weekly Niño 3 and 3.4 indices was apparent during the month. The oceanic heat content (average temperature in the upper 300m of the ocean) was also below-average, largely reflecting negative subsurface temperature anomalies in the eastern Pacific. At the same time, positive anomalies increased and expanded eastward to the central Pacific by late January. The variability in both the ocean and atmosphere was enhanced during January, at least partially due to a strong MJO. Consequently, the location of the MJO was reflected in the monthly averages of wind and convection. Despite these transient features contributing to cool conditions, collective atmospheric and oceanic system reflects ENSO-neutral.

SOUTHERN OSCILLATION INDEX

The 3-month average of the Southern Oscillation Index for the 4th Quarter of 2012 was 0.0, with monthly values of +0.3, +0.3, and –0.6 for the months of October, November and December 2012, respectively. Most of the second half of 2012 found conditions that supported the formation of an El Niño . However, the El Nino Watch never continued to a full-blown El Niño according to the CPC's ENSO Alert System Status. The El Niño Watch dissipated to ENSO-neutral in the last quarter of the year and continues into 2013.

Normally, positive SOI values in excess of +1.0 are associated with La Niña conditions, and negative SOI values below -1.0 are associated with El Niño conditions. Low SOI values suggest a weak coupling between the ocean and the atmosphere. The SOI is an index representing the normalized sea-level pressure difference between Darwin, Australia and Tahiti, respectively.

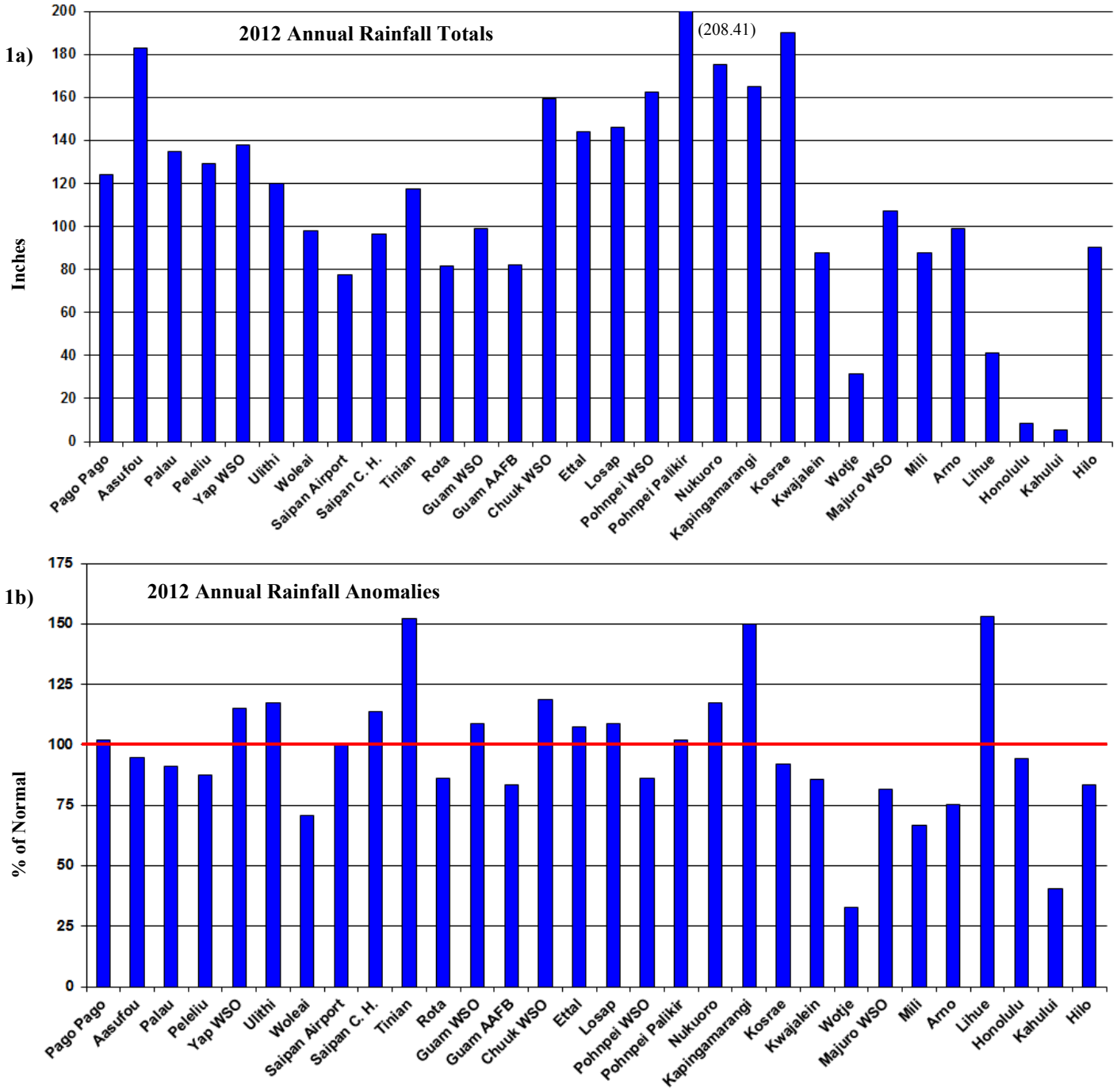

Figure 1, above. 2012 rainfall totals (a) in inches and (b) anomalies (expressed as % of normal). In 1b, solid line indicates normal rainfall (100%).

TROPICAL CYCLONE

The PEAC Center archives western North Pacific tropical cyclone numbers, track coordinates, and 1-minute average maximum sustained wind taken from operational warnings issued by the Joint Typhoon Warning Center (JTWC) of the U. S. Air Force and Navy, located at Pearl Harbor, Hawaii. Western North Pacific tropical cyclone names are obtained from warnings issued by the Japan Meteorological Agency (JMA), which is the World Meteorological Organization's Regional Specialized Meteorological Center (RSMC) for the western North Pacific basin. The PEAC archives South Pacific tropical cyclone names, track coordinates, central pressure, and 10-minute average maximum sustained wind estimates from advisories issued by TCWCs at Brisbane, Wellington and Port Moresby and RSMC-Nadi. The numbering scheme for Southern Hemisphere tropical cyclones and the 1-minute average maximum sustained wind estimates are taken from warnings issued by the JTWC, which has a warning responsibility to its constituency across the South Pacific and South Indian oceans that overlaps the local centers. Tropical cyclone advisories for eastern North Pacific tropical cyclones are provided by RSMC Miami, and tropical cyclone advisories for the central North Pacific (140° W to the 180° meridian) are provided by RSMC Honolulu. There are sometime differences in the statistics (e.g., storm maximum intensity) for a given tropical cyclone between the JTWC and the local centers that are noted in this summary.

Tropical Cyclone Summary

After several years of well-below normal tropical cyclone (TC) activity (especially within Micronesia), the 2012 western North Pacific typhoon season seemed very active. The basin annual count of TCs, however, was still shy of average. The activity was also displaced to the west and north of average, giving Micronesia another well-below normal typhoon season. During the calendar year of 2012, the JTWC numbered 27 TCs, with a distribution of 16 typhoons (TY), 9 tropical storms (TS) and 2 tropical depressions (TD). The average basin annual count of all TCs is 31 with the distribution of TYs, TSs and TDs of 18, 10 and 3, respectively. Of the 16 TYs observed during 2012, four reached super-typhoon status, which is the normal number of these intense TYs. The JMA annual count for the 2012 season was 23 named TCs, with a distribution of 9 TSs and 14 TYs.

The 2012 western North Pacific typhoon season started in February with TD 01W. TS Pakhar formed during March, and two cyclones (TY Sanvur and TY Mawar) formed during May. Three TCs formed during June, bringing the early season total to above normal. Above normal TC activity in the early season is hallmark of El Niño years, and was one of a few atmospheric signals consistent with the anticipated onset of El Niño. The basin was most active in August and October with five cyclones in each month. In contrast, September and November were unusually quiet. The number of TYs was above normal from May to August and below normal for the rest of the season. The basin activity was west and north of average, which kept things quiet in Micronesia. One of the basin's final TYs (Bopha), formed far to the south of Guam during November, and traveled westward on an unusual, very low-latitude (near 4°-6°N) track. This track saw Bopha pass to the south of Palau (7.4°N ; 134.4°E), with a later landfall on the Philippine Island of Mindanao. (See the Palau summary for more details). Severe damage and loss of life occurred when Bopha made landfall in Mindanao. The season finished in December with TS Wukong forming far to the west in the South China Sea.

The eastern North Pacific had a near normal distribution of TCs, with the NHC Miami naming 17 TCs with a distribution of 10 hurricanes (H) and 7 TSs. The average distribution for Hs and TSs is 10 and 6, respectively. It was quiet in the central North Pacific, with only two TCs of eastern North Pacific origin passing the 140°W meridian to enter the Central Pacific Hurricane Center (CPHC) Honolulu, area of responsibility. These two TCs dissipated before they reached Hawaii. There were no TCs given Hawaiian names by the CPHC during 2012.

The South Pacific was off to a very active start for their 2012-13 cyclone season. One of the first TCs of the season, TC Evan (TC 04P) formed near Fiji on December 09. It moved eastward and attained hurricane intensity as it passed over the Samoan island of Upolu. The Samoan capital city of Apia received damage from high winds and extreme stream flooding. On December Samoan authorities confirmed that the death toll reached 14. TC Evan was considered the worst cyclone to hit Samoa in 21 years (TC Val killed 15 people on the island in December 1991). Just before it reached American Samoa, TC Evan made a 180 degree turn, and moved westward back toward Fiji where it made a landfall on the northwest coastline of Viti Levu. The Pago Pago National Weather Service Forecast Office issued a gale watch for all of American Samoa a day before the storm impacted the island. As Evan intensified and moved closer to the islands of American Samoa, hurricane warnings and flash flood watches were issued for Tutuila, Aunuu, Manua and Swains Island. Evan never arrived at American Samoa. There were no reports of major damage or injuries in American Samoa after its brush with Evan.

PEAC Center Tropical Cyclone Outlook

The PEAC tropical cyclone outlook[1] for the first half of 2013 (the quiet half of the western North Pacific typhoon season) is for near normal tropical cyclone activity in the western North Pacific basin. The continuation of the ENSO-neutral weather patterns does not yield a consistent signal of cyclone activity. Early season cyclone activity is highest in years that see the onset of El Niño, and lowest in the years that follow El Niño. Two international agencies1 that publish long-range outlooks of TC activity for the western North Pacific have not yet done so. These outlooks are generally available by April 1st, and will be reported in the next PEAC Newsletter.

Shortly before the time of this writing, American Samoa experienced the passage of yet another TC, Garry (TC 08P). This cyclone passed safely to the north of Pago Pago on 22 January 2013 on its way towards the Cook Islands. A discussion of the impact of this (and any additional) cyclones on American Samoa will appear in the next PEAC Newsletter. With the observed repeated excursions of the northwest monsoon into Samoan waters, there is reason to believe that these conditions (conducive to cyclone formation) in the region of Fiji-Tonga-Samoa will continue episodically through April 2013. Two or three additional cyclones named by the Fiji RSMC are anticipated to form or pass through this region, bringing at least more heavy rain and gales to regional waters. The northwest monsoon will itself contribute to abundant rainfall in the area through April 2013.

[1]The PEAC tropical cyclone forecasts for 2012 are provisional. The PEAC considers input from three seasonal outlooks for tropical cyclone activity in the western North Pacific basin: (1) The City University of Hong Kong Laboratory for Atmospheric Research, under the direction of Dr. J. C-L. Chan; (2) The Benfield Hazard Research Centre, University College London, Tropical Storm Risk (TSR) research group, UK, led by Dr. Adam Lea and Professor Mark Saunders (http://www.tropicalstormrisk.com); and, (3) an experimental typhoon outlook produced by Paul Stanko (forecaster at the Guam WFO).

LOCAL SUMMARY AND FORECAST

NOTE: *That all Forecast rainfall quantities represent BEST ESTIMATES given the probabilistic forecast for each particular season and station.*

American Samoa: Monthly rainfall at American Samoa during 2012 was highly variable, with some wet months (e.g., March, May, Sept, Nov, and Dec) receiving two or three-times the rainfall of adjacent months. Overall, the 2012 annual total was near average. The year ended wet as the SPCZ became very active across the Samoa region. Slightly cooler-than-average equatorial SST coupled with higher-than-normal SST in the Fiji-Tonga-Samoa region may have helped to anchor the SPCZ further to the south allowing the Australian Northwest Monsoon to push eastward across this area in concert with active phases of the Madden-Julian Oscillation (MJO). When northwest winds occur to the north of the axis of the SPCZ, TC formation is facilitated within it. One of season's first South Pacific TCs (TC Evan) formed near Fiji, moved east across the Samoan island of Upolu, then reversed course just to the west of American Samoa. This dramatic track shift spared American Samoa from the damaging effects. During late January, another TC (Garry) passed safely to the north of American Samoa. At the time of this writing, the SPCZ remains active, with American Samoa near the axis of the trough. This is a dangerous place to be with respect to the tracks of cyclones.

American Samoa Rainfall Summary 4th Qtr 2012						
Station		**Oct.**	**Nov.**	**Dec.**	**4th Qtr**	**Annual**
Pago Pago WSO	**Inches**	4.99	18.34	18.31	**41.64**	**124.01**
	% Norm	46%	169%	126%	**115%**	**102%**
Aasufou	**Inches**	10.86	23.62	20.00*	**54.48**	**200.54**
	% Norm	54%	133%	103%	**95%**	**97%**

* Estimated value.

Climate Outlook: American Samoa is now entering the heart of its rainy season. The first two months of the rainy season (November and December 2012) were very wet. Climate models favor near normal to above normal rainfall over the next three-month period. This would be consistent with a continuation of the current weather pattern in which the axis of the SPCZ passes just south or over American Samoa. The risk of a damaging TC will remain higher-than-normal through April 2013. This means that two or three additional TCs will be named by the RSMC-Nadi in the region of Fiji-Tonga-Samoa. These cyclones and their monsoonal environment will ensure two or three more episodes of gusty northwest winds across the waters of American Samoa over the next three months, with the odds of another direct strike by the core of a TC on any island in American Samoa about 10-15%. By May, the SPCZ will still be near American Samoa, but by then it should be dominated by converging trade-wind flows that are typically associated with abundant rainfall, but with no further cyclone formation.

Predicted rainfall for American Samoa from January 2013 through December 2013 is:

For more information on American Samoa's weather and climate go to
http://www.prh.noaa.gov/samoa/

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Inclusive Period	**% of long-term average / Forecast rainfall (inches)** [1]
January - March 2013 (Heart of Rainy Season)	**120% (44.77 - Pago Pago)**
April - June 20123 (Onset of Next Dry Season)	**120%**
July - September 2013 (Heart of Next Dry Season)	**100%**
October - December 2013 (Onset of Next Rainy Season)	**100%**

Guam/CNMI: Throughout Guam and the CNMI, the weather and climate of 2012 continued a decade-long period of relative quiescence. Few extremes of rainfall or wind were noted. TY activity remained far below normal. Rainfall throughout the region was generally near normal for most months. March and April were very dry, with less than 2-inches reported at many locations during each of these two months, with the Saipan International Airport (SIA) receiving less than 1 inch in each of these months. Aug was the wettest month in the region, with most locations reporting a monthly total near 25 inches. Tinian topped the region's Aug rainfall with 32.05 inches. A weak monsoon flow was observed episodically from July through mid-Oct, with some episodes of heavy showers and high surf from distant cyclones and stronger monsoonal flow far to the southwest. For nearly a decade, there has been a notable lack of strong episodes of southwest monsoonal wind, intense monsoon squalls and associated TC formation. In mid-Oct, trade-winds abruptly returned to the region and remained in-place for the remainder of the year. This effectively shut-down all further heavy daily rainfall events, and Nov and Dec were thus quite dry. A couple monthly precipitation extremes occurred in the CNMI during the rainy season: (1) the 32.05 inches of rainfall recorded at Tinian during Aug was second only to the 37.85 inches recorded there during Aug 2004; and (2) the 24.91 inches of rainfall recorded at Tinian in Oct and the 20.52 inches of rainfall recorded at the SIA during the same month represent the wettest Octobers at both locations. The dry season is now

Guam Rainfall Summary 4th Qtr 2012						
Station		**Oct.**	**Nov.**	**Dec.**	**4th Qtr**	**Annual**
GIA (WFO)*	**Inches**	10.56	5.45	2.81	**18.82**	**99.07**
	% Norm	88%	66%	52%	**73%**	**109%**
AAFB**	**Inches**	8.68	4.90	3.93	**17.51**	**82.23**
	% Norm	67%	54%	66%	**63%**	**84%**
Dededo (Ypapao)	**Inches**	11.64	5.33	3.60	**20.57**	**105.32**
	% Norm	90%	59%	60%	**73%**	**107%**
Ugum Watershed	**Inches**	12.47	3.87	2.96	**19.30**	**98.95**
	% Norm	97%	43%	50%	**68%**	**100%**
Sinajaña	**Inches**	11.68	5.20	2.72	**19.60**	**100.69**
	% Norm	97%	63%	50%	**73%**	**111%**

*GIA-Guam International Airport, WFO-Weather Forecast Office
**AAFB-Anderson Air Force base

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underway on Guam and in the CNMI. Dry weather began early, with Nov and Dec having well below normal rainfall totals. Rainfall totals for January 2013 remained dry.

CNMI Rainfall Summary 4th Qtr 2012						
Station		**Oct.**	**Nov.**	**Dec.**	**4th Qtr**	**Annual**
Saipan Intl. Airport	**Inches**	20.52	1.69	4.45	**26.66**	**77.59**
	% Norm	190%	29%	116%	**125%**	**101%**
Capitol Hill	**Inches**	18.53	2.69	4.36	**25.28**	**96.50**
	% Norm	154%	37%	91%	**106%**	**116%**
Tinian Airport	**Inches**	24.91	2.74	5.63	**33.28**	**117.16**
	% Norm	208%	38%	117%	**138%**	**141%**
Rota Airport	**Inches**	14.59	3.19	1.92	**19.70**	**81.38**
	% Norm	115%	37%	34%	**73%**	**86%**

Climate Outlook: Climate models have a wide scatter of conditions for the anticipated rainfall over the next three months. The dynamic models indicate average to above average rainfall, while some statistical models predict below average rainfall. Only strong SST/SOI index values for an El Niño or La Niña have a large signal allowing for the most skillful predictions of rainfall for Guam and the CNMI. Given the scatter of the climate model predictions, there is now a large uncertainty for the predicted rainfall. Typically the demise of El Niño would be indicative of a drier than normal dry season, with drier monthly values and an extension of the dry season into June. Given that 2012 briefly reached the threshold of El Niño, and given the ongoing decadal reduction of TY activity, the next three to six months should feature near average to below average rainfall. It is anticipated that ENSO-neutral conditions will carry through the spring of 2013. Thereafter, there is no real skill at this time in projecting the status of ENSO. Persistence of current conditions and consideration of long-term trends would suggest that the typhoon season would be delayed, and the threats of a damaging TC would be slightly reduced from its long-term value for the entire year.

Predicted rainfall for the Mariana Islands from January 2013 through December 2013 is as follows:

Inclusive Period	**% of long-term average / Forecast rainfall (inches)** [1]	
	Guam/Rota	**Saipan/Tinian**
January – March 2013 (1st Half of Dry Season)	**90% (10.05 inches)**	**85% (6.58 inches)**
April – June 2013 (2nd Half of Dry Season)	**95%**	**95%**
July - September 2013 (Onset of Next Rainy Season)	**100%**	**100%**
October - December 2013 (2nd Half of Next Rainy Season)	**100%**	**100%**

Federated States of Micronesia

Yap State: During 2012, nearly all Yap island locations had annual rainfall that was above normal, with annual totals within about plus-or-minus 15 inches of 135 inches. The first few months of 2012 were drier than average, but heavy rainfall during the rainy season months of July through Oct were very wet. Water supplies from rain catchment, wells and the surface reservoir on Yap Island were adequate throughout the year. The 2012 annual total of 138 inches (115%) at the Yap WSO was representative of the island. Most of the atolls of Yap State saw abundant rainfall during 2012. Ulithi's annual total of 119.86 inches was 117% of average. At Woleai, in the southeast portion of the state, the 2012 annual total of 98.17 inches was only 71% of average. Despite the deficit, no reports were received of any problems with freshwater resources there. At the end of Nov, the atolls in the far south of Yap State were threatened by Super TY Bopha. The cyclone track, however, was so far south (at or equatorward of 6° N) that it spared even the southernmost atolls of Yap State from serious impact.

Yap State Rainfall Summary 4th Qtr 2012						
Station		**Oct.**	**Nov.**	**Dec.**	**4th Qtr**	**Annual**
Yap Island						
Yap WSO	**Inches**	17.08	10.67	8.68	**36.43**	**138.00**
	% Norm	143%	118%	97%	**121%**	**115%**
Dugor	**Inches**	18.09	9.04	8.52	**35.65**	**143.30**
	% WSO	151%	100%	95%	**119%**	**119%**
Gilman	**Inches**	13.26	7.20	3.82	**24.28**	**129.44**
	% WSO	111%	79%	42%	**81%**	**108%**
Luweech	**Inches**	18.88	15.25	5.84	**39.97**	**142.39**
	% WSO	158%	168%	65%	**133%**	**119%**
Maap	**Inches**	21.71	5.06	4.55	**31.32**	**120.17**
	% WSO	181%	56%	51%	**104%**	**100%**
North Fanif	**Inches**	17.70	9.65	7.49	**34.84**	**149.35**
	% WSO	148%	106%	83%	**116%**	**124%**
Rumung	**Inches**	17.22	7.84	10.86	**35.92**	**129.95**
	% WSO	144%	86%	121%	**120%**	**108%**
Tamil	**Inches**	17.82	7.01	7.84	**32.67**	**130.77**
	% WSO	149%	77%	87%	**109%**	**109%**
Outer Islands						
Ulithi	**Inches**	16.62	4.16	7.39	**28.17**	**119.86**
	% Norm	163%	54%	97%	**110%**	**117%**
Woleai	**Inches**	8.33	10.44	4.43	**23.20**	**98.17**
	% Norm	61%	97%	39%	**77%**	**71%**

Climate Outlook: Yap State is now in its dry season. The months of Feb-April are the heart of the normal dry season. With the anticipated continuation of ENSO-neutral conditions during the next few months, the rainfall throughout Yap State should be near average to slightly above average for the dry season. The rainy season should begin on time in late May or early June, with perhaps a slight delay at Ulithi and other atolls in the northeastern portion of the state. Although there has been a decline of TC activity throughout Micronesia over the past decade, Yap State is far enough to the west that its odds of impact from a TC are anticipated to be only slightly reduced through the first

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half of 2013. Rainfall should then become near normal for the remainder of 2013. Normal TC activity in Yap State typically features one named storm passage through the state in the spring, two or three storm passages to the north of the state during the summer months that produce gusty (but not destructive) southwest winds across regional waters, and one passage of a cyclone through the state in the fall.

Predicted rainfall for Yap State from January 2013 through December 2013 is as follows:

Inclusive Period	% of long-term average / Forecast rainfall (inches) [1]	
	Yap and Ulithi	Woleai
January – March 2013 (Heart of Dry Season)	**110% (20.71 inches)**	**90% (23.83 inches)**
April – June 2013 (Onset of Rainy Season)	**100%**	**90%**
July – September 2013 (Heart of Next Rainy Season)	**110%**	**95%**
October – December 2013 (End of Next Rainy Season)	**110%**	**90%**

Chuuk State: The 2012 annual rainfall throughout Chuuk State was near normal to above normal. Only two atolls (Fananu and Polowat) reported below normal annual totals with 61% and 86% of average, respectively. April was the driest month at most Chuuk rain recording sites. The distribution of wet months was more randomly scattered with May and Aug being the wettest two months at the Chuuk WSO, and Jan and July being the wettest two months at Ettal atoll in the southern Mortlocks. Abundant rainfall continued through Jan 2013 at most Chuuk locations. Gusty trade winds were the notable weather element during recent weeks. The weather was generally tranquil during 2012, with few extremes of wind or rainfall. During late November 2012, TY Bopha developed at a very low latitude (4° N) southeast of Chuuk state. While in the area of Chuuk State, Bopha had the structure of a large monsoon depression and as it moved westward at low latitudes, its wind and rain affected some of the low latitude atolls in the southern Mortlocks. Reports indicated that three atolls of Chuuk State suffered damage during the passage of Bopha: homes were damaged at Ta (5.3° N) and livelihoods were interrupted at Lukunoch (5.5°N) and on the Kuttu Atoll (5.45°N).

Chuuk State Rainfall Summary 4th Qtr 2012						
Station		Oct.	Nov.	Dec.	4th Qtr	1st Half
Chuuk Lagoon						
Chuuk WSO	Inches	14.68	15.30	13.09	**43.07**	**159.40**
	% Norm	109%	148%	121%	**124%**	**119%**
Piis Panew	Inches	16.24	11.73	10.61	**38.58**	**147.96**
	% WSO	121%	114%	98%	**112%**	**110%**
Southern Mortlocks						
Lukunoch	Inches	8.39	16.18	7.00	**31.57**	**136.20**
	% Norm	81%	148%	54%	**92%**	**95%**
Ettal*	Inches	7.74	16.46	7.82	**32.02**	**144.24**
	% Luk	76%	151%	61%	**94%**	**100%**
Ta*	Inches	5.20	9.14	4.23	**18.57**	**146.83**
	% Luk	50%	84%	33%	**54%**	**102%**

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Chuuk State Rainfall Summary 4th Qtr 2012						
Station		Oct.	Nov.	Dec.	4th Qtr	1st Half
Northern Atolls						
Fananu	Inches	11.76	6.29	6.50	**24.55**	**81.38**
	% WSO	88%	61%	60%	**71%**	**61%**
Onoun	Inches	10.92	6.47	16.99	**34.38**	**137.53**
	% WSO	81%	63%	157%	**99%**	**102%**
Northern Mortlocks						
Losap	Inches	11.83	14.19	6.37	**32.39**	**147.97**
	% WSO	88%	137%	59%	**94%**	**110%**
Nama	Inches	15.40	23.10	10.77	**49.27**	**168.16**
	% WSO	115%	224%	99%	**142%**	**125%**
Namoluk	Inches	7.39	14.88	5.61	**27.88**	**128.53**
	% WSO	57%	144%	52%	**81%**	**96%**
Western Atolls						
Polowat	Inches	10.52	7.72	10.55	**28.81**	**103.59**
	% Norm	88%	83%	115%	**95%**	**86%**

* % based on Lukunoch normal.

Climate Outlook: During the first few months of 2013, the most likely scenario would be for the current ENSO-neutral conditions to continue. Thereafter there is a wide spread of dynamic and statistical model forecasts of the evolution of ENSO. With ENSO-neutral conditions in-place for the next few months, easterly trade winds should continue to dominate the flow throughout Chuuk State. Rainfall will be near normal, with a greater chance for above normal rainfall at atolls further to the south (e.g., Lukunoch, Ettal and Ta), and a greater chance for below normal rainfall at atolls further to the north (e.g., Fananu and Onoun). Heavy rainfall could occur across central and southern portions of Chuuk State in the northern hemisphere spring (April and May) when the trade-wind trough sets-up through the area. Thereafter, near normal rainfall is anticipated. TC activity will depend largely on the evolution of ENSO. Currently, we expect near normal activity. If an El Nino were to develop, the TC risk to Chuuk State would increase. And, if La Nina were to develop, the TC risk to Chuuk State would decrease.

Predictions for Chuuk State from January 2013 through December 2013 are as follows:

Inclusive Period	% of long-term average / Forecast rainfall (inches) [1]			
	Chuuk Lagoon, Losap, and Nama	Polowat	Northern Atolls and Islands	Southern Mortlocks
Jan – Mar 2013	**100% (25.77 inches)**	**90% (23.19 in)**	**85% (21.90 in)**	**100% (25.76 in)**
Apr – Jun 2013	**120%**	**95%**	**90%**	**110%**
Jul – Sep 2013	**110%**	**95%**	**100%**	**100%**
Oct – Dec 2013	**100%**	**95%**	**100%**	**100%**

LOCAL SUMMARY AND FORECAST

Pohnpei State: Once again, the weather conditions on Pohnpei Island and on most atolls of Pohnpei State were tranquil and unremarkable. During 2012, with the exception of Kapingamarangi and Nukuoro where it was very wet for most of the year, rainfall on Pohnpei Island and most of the atolls was near average. The annual rainfall total of 171.33 inches at Kapingamarangi was 156% of average, while the 175.56 inches at Nukuoro was 118% of average. The Kapingamarangi value was the highest percentage departure from average for this statistic of any recording site in Micronesia. A possible contributing factor for this heavy rainfall was the warmer SST along the equator there during 2012 with respect to average and with respect to recent years. During strong La Niñas, when the SST is colder than average along the equator, Kapingamarangi can be quite dry, as was the case during Oct 2010 through Feb 2011. As usual, Palikir topped the list of rainfall totals in Pohnpei State during 2012 with 208.41 inches (102%). This was the highest annual total rainfall observed throughout Micronesia during 2012. A few miles away at the weather service office, Pohnpei, the rainfall total during 2012 was 162.27 inches (86%). In the final weeks of the year, trade winds became strong, with gusts to 40 mph recorded on Pohnpei Island. These gusty winds blew down signs and some banana trees. High surf accompanied the strong trade winds, but no serious inundation was reported.

Pohnpei State Rainfall Summary 4th Qtr 2012

Station		Oct.	Nov.	Dec.	4th Qtr	Annual
Pohnpei Island						
Pohnpei WSO	Inches	12.59	16.18	11.37	**40.14**	**162.27**
	% Norm	75%	103%	77%	**84%**	**86%**
Palikir	Inches	21.05	15.25	11.00	**47.41**	**208.41**
	% Norm	117%	90%	68%	**92%**	**102%**
Kolonia Airport	Inches	14.02	17.36	12.45	**43.83**	**162.13**
	% Norm	102%	134%	100%	**112%**	**104%**
Atolls of Pohnpei State						
Nukuoro	Inches	15.42	20.43	3.79	**39.64**	**175.56**
	% Norm	143%	170%	32%	**114%**	**118%**
Pingelap	Inches	6.28	17.69	8.48	**32.45**	**131.73**
	% Norm	42%	124%	63%	**76%**	**74%**
Mwoakilloa	Inches	6.86	12.24	9.90	**29.00**	**125.13**
	% Norm	50%	95%	79%	**74%**	**81%**
Kapingamarangi	Inches	11.66	15.44	7.25	**34.35**	**171.33**
	% Norm	242%	189%	83%	**158%**	**156%**

Climate Outlook: With ENSO-neutral firmly established, moderately strong trade winds should continue to dominate throughout Pohnpei State for the next several months. Normally, Feb is the driest month for most Pohnpei locations. Then, as the trade wind trough (often called the ITCZ) strengthens in the northern hemisphere spring, the heaviest monthly rains commence. Rainfall throughout Pohnpei State is anticipated to be near average to above average for the next several months, with a typical monthly distribution (e.g., driest in Feb and wettest in May, June and July). The recent persistent very heavy rainfall experienced at Kapingamarangi should ease a bit in the coming months. This risk on Pohnpei Island, or any of the atolls of Pohnpei State, of hazardous effects from TCs is anticipated to be very low during 2013.

Predicted rainfall for Pohnpei State from January 2013 through December 2013 is as follows:

Inclusive Period	% of long-term average / Forecast rainfall (inches) [1]	
	Pohnpei Island and Atolls	Kapingamarangi
Jan - Mar 2013	**110% (37.32 inches)**	**120% (59.31 inches)**
Apr - Jun 2013	**120%**	**110%**
Jul - Sep 2013	**100%**	**100%**
Oct - Dec 2013	**100%**	**100%**

Kosrae State: Kosrae, like most islands in the eastern half of Micronesia and Hawaii, has seen a long-term decline of annual rainfall. During 2012, most Kosrae locations fell somewhat short (15 to 20 inches) of their long-term average annual rainfall values of slightly over 200 inches. The 2012 annual total at the Kosrae International Airport of 190.12 inches (92%) was 16.05 inches short of the annual average. In Kosrae, the decline of annual rainfall has not been widely noticed (and the shortfall in 2012 was relatively small), but it is part of an ongoing shift to a drier rainfall climate in the region that does not yet have a generally accepted explanation. Climate model simulations for a warmer world indicate that annual rainfall should increase throughout most of Micronesia, especially in the western parts. The observed decline in the modern record is being viewed as part of natural variability on inter-decadal time scales, eg. As part of the Pacific Decadal Oscillation (PDO) rainfall pattern.

As seen in Pohnpei, gusty trade winds were also experienced in Kosrae in the final weeks of 2012. A gust to 31 kt was recorded at the airport. These winds blew over some banana trees, and also took out some other somewhat stronger trees and branches. High surf of 6-8 feet was also noted. Jan 2013 began wet, and sets the stage for what the next few months may bring.

Kosrae State Rainfall Summary 4th Qtr 2012

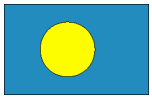
Station		Oct.	Nov.	Dec.	4th Qtr	Annual
Airport (SAWRS)	Inches	12.33	16.49	17.75	**46.57**	**190.12**
	% Norm	76%	104%	122%	**100%**	**92%**
Utwe	Inches	16.06	17.94	15.70	**49.70**	**186.04**
	% WSO	99%	113%	108%	**107%**	**90%**
Tofol	Inches	13.69	15.51	19.05	**48.25**	**170.85**
	% WSO	86%	98%	131%	**104%**	**83%**
Nautilus Hotel	Inches	11.43	15.96	16.95	**44.34**	**180.86**
	% WSO	71%	100%	117%	**95%**	**88%**

LOCAL SUMMARY AND FORECAST

Climate Outlook: With ENSO-neutral conditions expected to continue for the next several months, near average to above average rainfall is anticipated at Kosrae. Persistent trade-wind conditions should continue. The months of March through June (normally the wettest of the year on Kosrae) are anticipated to have near average to above average rainfall. Normal monthly rainfall values at Kosrae are typically between 16 and 20 inches for all months of the year. No adverse TC activity is expected for Kosrae State during 2013.

Predicted rainfall for Kosrae State from January 2013 through December 2013 is as follows:

Inclusive Period	% of long-term average / Forecast rainfall (inches) [1]
January – March 2013	**110% (54.35 inches)**
April – June 2013	**110%**
July - September 2013	**100%**
October - December 2013	**100%**



Republic of Palau: Apart from the impacts of Super Typhoon Bopha, the weather and climate conditions during 2012 in the Republic of Palau were tranquil and uneventful. The annual rainfall was near normal at most locations. Of course, Bopha was the big event of 2012. TY Bopha (JTWC designation: TC 26W) originated unusually close to the equator (3.1°N ; 157.8°E), well to the southwest of Pohnpei Island. It tracked westward at very low latitude (at or south of 5°N) during the period 25 Nov through 01 Dec. On Dec 02, the TC reached super intensity (at or above 130 kt sustained one-minute wind), and began to gain latitude on a path toward Palau. As the sun set on the evening of 02 Dec, it appeared that this dangerous typhoon would make a direct strike across the southern portions of Palau, including Angaur, Peleliu and Koror. This would have caused catastrophic damage and loss of life. At just the right time, the TY made a track change to a more westerly direction, taking it far enough to the south of Palau to spare the country a large disaster. With a track further to the south, some locations were still hit hard, particularly the more southerly locations of Anguar and Peleliu. While much of central and northern locations faired well from TY Bopha, a few of the villages on the eastern side of the island of Babeldaob were hit extremely hard by sea inundation. Assessment teams

Republic of Palau Rainfall Summary 4th Qtr 2012						
Station		**Oct.**	**Nov.**	**Dec.**	**4th Qtr**	**Annual**
WSO Koror	**Inches**	9.23	7.68	11.52	**28.43**	**134.83**
	% Norm	67%	68%	96%	**76%**	**91%**
Nekken*	**Inches**	12.10	5.96	13.91	**31.97**	**450.86**
	% Norm	87%	53%	116%	**86%**	**102%**
Intl. Airport	**Inches**	9.94	8.50	16.30	**64.74**	**164.84**
	% Norm	86%	107%	65%	**93%**	**111%**
Peleliu	**Inches**	12.19	9.42	16.42**	**38.03**	**139.05**
	% Norm	90%	86%	140%	**105%**	**99%**

*Estimated from nearby stations

**Includes an estimated 10 inches for TY Bopha.

LOCAL SUMMARY AND FORECAST

under the coordination of the Palau National Emergency Management Office conducted an Initial Damage Assessment of 666 residences in 6 affected states. Initial results indicate 112 houses completely destroyed and 136 houses with major damages.

Climate Outlook: The distribution of rainfall on Palau during 2013 is anticipated to be near average to above average. Whether the current ENSO-neutral conditions evolve toward El Niño, La Niña, or remain ENSO-neutral during 2013 would make only slight changes to the distribution of rainfall in the outlooks: El Niño onset in 2013 would cause a reduction of rainfall late in the year, and a continuation of ENSO-neutral or onset of La Niña during the latter half of 2013 would likely result in a near-normal distribution of monthly rainfall for the entire year. A near-average distribution of southwest monsoon flow, monsoon depressions and other tropical disturbances will provide abundant rainfall to Palau throughout the year. Based on the need for a typhoon to follow an unusual low-latitude track to directly affect Palau, we don't anticipate a repeat of Bopha anytime soon.

Predicted rainfall for Palau from January 2013 through December 2013 is as follows:

Inclusive Period	% of long-term average / Forecast rainfall (inches) [1]
January – March 2013	**110% (32.60 inches)**
April – June 2013	**110%**
July – September 2013	**100%**
October – December 2013	**100%**

Republic of the Marshall Islands (RMI): 2012 annual rainfall totals were below average at all RMI reporting sites. The 107.25 inches (82%) recorded at the Majuro WSO was the highest rainfall amount recorded in the RMI for the year. At Kwajalein, there was a 24-hour rainfall of 6.82 inches in mid-Dec. This was reported to be the 8th highest 24-hour rainfall total in their climatic record and one of the largest not associated with a TC. Even with this big rain day and a very wet Dec, the 2012 annual total of 87.49 inches (86%) at Kwajalein was still below average. Some of the northern atolls of the RMI (e.g., Wotje and Utirik) had very low 2012 annual rainfall amounts (less than 50% of average). Also, strong trade winds and high surf were experienced in the final weeks of the year. Because the RMI was just coming out of its rainy season at the end of the year and beginning the dry season, there was no immediate concern with water quantity. The reservoir at the Majuro International Airport was at 50% capacity at the beginning of Jan 2013, but fell to one-third capacity in early Feb. Continued dryness through Jan 2013, and the projected continuation of dry conditions for at least another month or two, led to more serious concerns over the adequacy of the supply of fresh water in the RMI. In late Jan, WFO Guam issued Special Weather Statements for dry conditions in the RMI. On 5 Feb 2013, the WFO Guam, in coordination with the WSO Majuro, issued a Drought Information Statement for the RMI and for a few islands in Chuuk State: "...Very dry weather is affecting the Marshall islands and parts of Chuuk state...Synopsis...ENSO-Neutral conditions prevail across the Pacific Ocean. Strong win-

LOCAL SUMMARY AND FORECAST

ter-time high pressure has become established over the central Pacific...and dry weather persists between about 7 and 25 degrees north latitude from 150 degrees east longitude all the way eastward across the dateline. Climate models indicate this ENSO-neutral pattern will continue for the next five weeks...possibly into April. Models indicate very little rain can be expected for Majuro and most northern atolls of the Marshall Islands in the coming weeks. Models also show mostly dry weather stretching across portions of Chuuk State. Serious drought conditions are likely for atolls of the Marshall Islands from Majuro northward… including Ebeye… Enewetak… Wotje… and Utirik. Atolls south of Majuro will also experience dry season type weather… but should receive heavier trade-wind showers at times in the coming weeks. Strong water conservation measures will be needed to avoid the depletion of wells...reservoirs and catchments. As of 5 February 2013...Majuro reservoir contains 9.947 million gallons of water...or less than one-third capacity."

RMI Rainfall Summary 4th Qtr 2012						
Station		**Oct.**	**Nov.**	**Dec.**	**4th Qtr**	**Annual**
RMI Central and Southern Atolls (6º N - 8º N)						
Majuro WSO	**Inches**	5.84	20.69	5.09	**32.62**	**107.25**
	% Norm	42%	161%	43%	**85%**	**82%**
Laura	**Inches**	7.60	20.81	7.63	**36.04**	**110.36***
	% WSO	55%	163%	64%	**94%**	**84%**
Mili	**Inches**	12.24	17.31	8.55	**38.10**	**87.77**
	% WSO	88%	135%	72%	**99%**	**67%**
Aling-laplap	**Inches**	8.92	7.63	7.96	**24.51**	**84.44**
	% WSO	69%	65%	80%	**71%**	**72%**
Jaluit	**Inches**	4.10	5.94	3.31	**13.35**	**76.02**
	% WSO	30%	46%	28%	**35%**	**58%**
Arno	**Inches**	5.67	16.78	7.54	**29.99**	**99.08**
	% WSO	41%	131%	64%	**78%**	**75%**
RMI Northern Atolls (North of 8º N)						
Kwajalein	**Inches**	8.18	5.09	15.33	**28.60**	**87.49**
	% Norm	69%	48%	189%	**93%**	**86%**
Wotje	**Inches**	3.78	2.06	2.31	**8.15**	**31.71**
	% Norm	33%	20%	30%	**28%**	**33%**
Utirik	**Inches**	3.73	1.20	1.49	**6.42**	**35.28**
	% Norm	37%	13%	22%	**25%**	**41%**

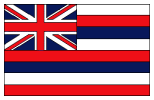
*Laura was reactivated in October 2012. Readings from Jan-Sep 2012 are from Majuro WSO.

Climate Outlook: As noted in the summary above, there is concern that dry conditions in the RMI will soon lead to serious problems with the availability of fresh water. A Drought Information Statement has been issued to address this. All available forecast guidance indicates that dry conditions will continue for at least the next several weeks. By April, showers in the trade wind trough should begin to provide increased rainfall for family rain catchments and for the filling of the Majuro airport reservoir. It will take another month or two (possibly until June 2013) for increased rainfall to reach the atolls of the northern RMI, and alleviate water problems there. After pushing through this very difficult dry season, the rest of 2013 should see near average rainfall throughout the RMI.

LOCAL SUMMARY AND FORECAST

Predicted rainfall for the RMI from January 2013 through December 2013 is as follows:

Inclusive Period	**% of long-term average / Forecast rainfall (inches)** [1]		
	South of 6ºN	**6ºN to 8ºN**	**North of 8ºN**
Jan – March 2013 (Dry Season)	**95% (22.21 inches)**	**95% (22.21 in)**	**90% (11.40 in)**
April – June 2013 (Onset of Rains)	**95%**	**100%**	**95%**
July – Sept 2013 (Rainy Season)	**100%**	**100%**	**100%**
Oct – Dec 2013 (Start of Dry Season)	**100%**	**100%**	**100%**



Hawaii: Several heavy rain events in January brought varying levels of drought relief to all four counties across the state of Hawaii. For some locations, it was the wettest January in at least five years. The entire island of Kauai is now considered to be drought free. However, extreme drought conditions persist in portions of Maui and the Big Island.

In Hawaii, the decline of annual rainfall has been ongoing for its entire 100-year record, and has become a notable water resource issue. A lack of eastern North Pacific TC remnants impacting Hawaii in the recent decade may be a contributing factor to the long-term decline of rainfall in the Hawaiian Islands.

State of Hawaii Rainfall Summary 4th Qtr 2012						
Station		**Oct.**	**Nov.**	**Dec.**	**4th Qtr**	**Annual**
Lihue Airport	**Inches**	0.35	0.58	4.25	**5.18**	**41.06**
	% Norm	11%	16%	134%	**52%**	**153%**
Honolulu Airport	**Inches**	0.09	0.22	0.01	**0.32**	**8.60**
	% Norm	7%	16%	1%	**8%**	**94%**
Kahului Airport	**Inches**	0.01	0.23	0.24	**0.48**	**5.18**
	% Norm	2%	13%	9%	**10%**	**40%**
Hilo Airport	**Inches**	2.91	5.52	11.49	**19.92**	**90.39**
	% Norm	34%	49%	112%	**66%**	**84%**

Climate Outlook: The long-lead outlook issued on Jan 17, 2013 by the NOAA Climate Prediction Center indicates that below normal temperatures are favored for Hilo and Kahului in Feb, March , and April of this year. This signal comes from the climate model forecasts for persisting below normal SST's surrounding the southeastern Hawaiian Islands for the next few months. The probabilities also favor below normal precipitation for the rest of the wet season, or through the end of April. The next long-lead outlook will be issued by the CPC on February 21, 2013

For more information on weather and climate in Hawaii go to
http://www.prh.noaa.gov/pr/hnl/
or
www.cpc.noaa.gov/products/predictions/long_range/fxhw40.html

Seasonal Sea Level Outlook for the US-Affiliated Pacific Islands

The following sections describe: (i) the *Canonical Correlation Analysis (CCA)* forecasts for seasonal (mean and maxima) sea-level deviations for the forthcoming seasons JFM, FMA, and MAM of 2013, (ii) the observed monthly mean and maximum sea-level deviations for the season OND 2012, and (iii) a Synopsis of ENSO and seasonal sea level variability. *Note that the deviations are defined as 'the difference between the mean sea level for the given month and the 1983 through 2001 mean sea level value computed at each station'. Also note that all sea level deviation calculations beginning January 2013, will use the 1983-2001 mean values.*

(i) Seasonal Sea Level Forecast *(deviations with respect to climatology*) for JFM, FMA and MAM 2013 (Table 1).

Forecasts of the sea-level deviations in the USAPI (see http://www.prh.noaa.gov/peac/map.php for location of stations) are presented using the CCA statistical model based on the independent SST values in OND 2012. The resulting CCA model has been used to forecast the sea-level of three consecutive months: JFM**,** FMA, and MAM (see Table 1). All the tide gauge stations (at 0 to 2-months lead time) show skillful forecasts for these three consecutive seasons (Table 1: bottom panel). Consistent with the on-going ENSO-neutral conditions, the sea level in these islands is projected to be close to normal.

Table 1: **Forecasts of Sea Level Deviation (in inches) for JFM, FMA, and MAM 2012.**

	Seasonal Mean Deviations				Seasonal Max Deviations					
Tide Gauge Station	**JFM**	**FMA**	**MAM**	**Forecast Quality**	**JFM**	**FMA**	**MAM**	**Forecast Quality**	***Return Period for JFM Season***	
Lead Time	*0*	*1M*	*2M*		*0*	*1M*	*2M*		*20 Year*	*100 Year*
Marianas, Guam	+1	+2	+3	V. Good	+17	+17	+18	V. Good	5.6	6.7
Malakal, Palau	-2	-1	0	V. Good	+35	+37	+36	Good	9.6	14.3
Yap, FSM	-2	-	0	V. Good	+26	+29	+30	Good	16.7	33.0
Chuuk, FSM**	+2	+3	+3	N/A	+26	+28	+28	N/A	N/A	N/A
Pohnpei, FSM	+2	+3	+4	V. Good	+32	+33	+33	V. Good	5.8	7.1
Majuro, RMI	+2	+3	+2	Good	+44	+44	+43	Good	4.1	5.1
Kwajalein, RMI	+2	+3	+4	V. Good	+42	+42	+42	V. Good	4.5	5.9
Pago Pago, Am. Samoa	+3	+3	+3	V. Good	+28	+27	+26	V. Good	3.9	5.4
Honolulu, Hawaii	0	0	0	Fair	+19	+17	+18	Fair	4.1	5.9
Hilo, Hawaii	0	0	0	Good	+24	+22	+22	Fair	7.9	11.4

Note: (-) indicates negative deviations (fall of sea level from the mean), and (+) indicates positive deviations (rise of sea level from the mean); N/A: data not available. Deviations from -1 to +1 inch are considered negligible, and deviations from –2 to +2 inches are unlikely to cause any adverse climatic impact. Forecasts for Chuuk (**) are estimated subjectively based on information from WSO Chuuk and observations from neighboring stations of Pohnpei and Yap. See http://www.prh.noaa.gov/peac/peu/2013_1st/sea_level.php#footnote for explanations of footnotes 1 through 5.

Remarks: The forecast values of sea level for JFM, FMA, and MAM seasons (Table 1, above) indicate that most of the stations in the north Pacific region are likely to be marginally (e.g., 1-3 inches) higher than normal in the forthcoming seasons. The south Pacific stations (e.g., Pago Pago) are likely to be about 2-3 inches higher than normal during the same time period. In Hawaii, both Honolulu and Hilo are likely to be close to normal during the same time period.

Falling sea levels in the USAPI region in the recent months are supportive to the on-going ENSO-neutral conditions, as according to CPC-IRI's ENSO Alert System (see page 12), ENSO-neutral is favored for the Northern Hemisphere winter 2012-13 season and into spring 2013. Upper-level and lower-level zonal winds were near average, and convection was slightly suppressed over the eastern and central tropical Pacific. Thus, both the atmosphere and ocean indicated ENSO-neutral conditions, which may portend a possible reason for lower sea levels in the north Pacific region.

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Seasonal Sea Level Outlook for the US-Affiliated Pacific Islands

(ii) Observed Monthly Sea Level Deviation in OND 2012. The monthly time series (OND) for sea level deviations have been taken from the UH Sea Level Center. The full time series (in mm) for monthly mean is available at: ftp://ilikai.soest.hawaii.edu/islp/slpp.deviations.

Table 2 : Monthly Observed Max/Mean Sea Level Deviations in Inches (1 inch = 25.4mm)

Tide Gauge Station	Monthly Mean Deviations[1]				Monthly Max Deviations[2]			
	Oct.	Nov.	Dec.	Standard Deviations	Oct.	Nov.	Dec.	Standard Deviations
Marianas, Guam	+3.0 (-1.2)	+5.4 (+0.5)	+6.2 (+1.3)	4.0	+18 (+14)	+21 (+16)	+21 (+16)	3.5
Malakal, Palau	+6.8 (+5.0)	+5.5 (+3.0)	+5.7 (+3.0)	4.0	+44 (+43)	+43 (+39)	+42 (+40)	4.1
Yap, FSM	+1.9 (0.0)	+2.3 (0.0)	+3.5 (+1.4)	4.1	+29 (+27)	+31 (+29)	+29 (+27)	4.1
Pohnpei, FSM	+2.9 (+0.4)	+2.9 (+0.4)	+2.9 (+0.4)	4.7	+37 (+35)	+37 (+35)	+37 (+35)	4.9
Majuro, RMI	+3.2 (+1.5)	+4.0 (+2.2)	+4.0 (+2.2)	3.7	+43 (+42)	+46 (+44)	+44 (+42)	3.8
Kwajalein, RMI	+4.0 (+0.5)	+3.5 (0.3)	+3.5 (+0.3)	3.1	+42 (+39)	+42 (+39)	+43 (+40)	3.2
Pago Pago, American Samoa	+8.6 (+5.4)	+7.6 (+4.5)	+6.8 (+3.8)	2.5	+31 (+28)	+32 (+29)	+35 (+32)	2.2
Honolulu, Hawaii	+1.4 (+0.6)	+2.8 (+2.0)	+2.1 (+1.4)	1.8	+19 (+18)	+22 (+21)	+22 (+21)	2.6
Hilo, Hawaii	0.0 (-1.3)	+0.3 (+1.1)	-1.6 (-2.7)	1.8	+21 (+20)	+22 (+20)	+22 (+20)	2.2

[*] Data currently unavailable; [1] Difference between the mean sea level for the given month and the 1983 through 2001 mean sea level value at each station; [2] Same as [1] except for maxima; SD stands for standard deviations.

Remarks: A synopsis of the last 3-months sea level variability is as follows: (1) As compared to September, all stations (except Guam) registered fall in October; (2) In November most of the stations registered slight rise; and (3) In December, sea level did not change much. However, Guam, Palau, and Yap registered slight rise. Currently, based on the 1983-01 mean value, all north Pacific stations (except Malakal at Palau) are 2-6 inches higher than normal, and based on 2001-10 mean value (in parenthesis), all north Pacific stations are 1-3 inches higher than normal.

(iii) ENSO and Seasonal Sea Level Variability: A Synopsis

Table 3: Sea-Level Deviation in Current and Major ENSO Years

	Seasonal Mean Deviations: Observed rise/fall (inches)					
	OND '13 (ENSO neutral)	**OND '12 (Moderate-to-weak La Nina)**	**JFM '98 (Strong El Nino)**	**JFM '99 (Strong La Nina)**	**OND '97 (Strong El Nino)**	**OND '98 (Strong La Nina)**
Marianas, Guam	+4	+4	-6	+6	**-7**	**+6**
Malakal, Palau	+6	+7	-9	+6	**-7**	**+8**
Yap, FSM	+2	+4	-7	+5	**-9**	**+8**
Majuro, RMI	+4	+6	-3	+1	**-10**	**+3**
Kwajalein, RMI	+4	+6	-4	+2	**-7**	**+2**
Pago Pago	+8	+8	-7	+3	**+1**	**-4**

Remarks: As the sea level in the USAPI is very sensitive to the phase of the ENSO climate cycle, a perspective of sea level anomalies during the recent ENSO event (2011-13) and the historically strongest ENSO events of 1997-99 is presented in Table 3 above. The objective is to provide an insight to the readers about the strength of on-going ENSO and the trend of rising sea level. Note that 1997 was a major El Nino (strong) year and 1998 was a major (strong) La Nina year.

Pacific ENSO Update

Excerpts from El NIÑO/SOUTHERN OSCILLATION (ENSO) DIAGNOSTIC DISCUSSION

Issued by NOAA NWS Climate Prediction Center - 7 February 2013

http://www.cpc.noaa.gov/products/analysis_monitoring/enso_advisory/index.shtml

ENSO Alert System Status: Not Active

Synopsis: ENSO-neutral is favored through Northern Hemisphere spring 2013.

During January 2013, ENSO-neutral continued, although below-average sea surface temperatures (SST) prevailed across the eastern half of the equatorial Pacific. While remaining below average, a high degree of variability in the weekly Niño 3 and 3.4 indices was apparent during the month. The oceanic heat content (average temperature in the upper 300m of the ocean) was also below-average, largely reflecting negative subsurface temperature anomalies in the eastern Pacific. At the same time, positive anomalies increased and expanded eastward to the central Pacific by late January. The variability in both the ocean and atmosphere was enhanced during January, at least partially due to a strong Madden-Julian Oscillation (MJO). Consequently, the location of the MJO was reflected in the monthly averages of wind and convection. Anomalous upper-level winds were westerly over the eastern half of the equatorial Pacific, while low-level winds were near average. Relative to December 2012, the region of enhanced convection shifted eastward and became more prominent over Indonesia and the western equatorial Pacific. Despite these transient features contributing to cool conditions, the collective atmospheric and oceanic system reflects ENSO-neutral.

The vast majority of models predict near-average SST (between -0.5°C and +0.5°C) in the Niño-3.4 region through the late Northern Hemisphere summer. However, because model skill is generally low during April-June, there is less confidence in the forecast beyond the spring. Thus, ENSO-neutral is favored through Northern Hemisphere spring 2013 (see CPC/IRI consensus forecast).

This discussion is a consolidated effort of the National Oceanic and Atmospheric Administration (NOAA), NOAA's National Weather Service, and their funded institutions. Oceanic and atmospheric conditions are updated weekly on the Climate Prediction Center web site (El Niño/La Niña Current Conditions and Expert Discussions). Forecasts for the evolution of El Niño/La Niña are updated monthly in the Forecast Forum section of CPC's Climate Diagnostics Bulletin. The next ENSO Diagnostics Discussion is scheduled for 7 March 2013. To receive an e-mail notification when the monthly ENSO Diagnostic Discussions are released, please send an e-mail message to: ncep.list.enso-update@noaa.gov.

The Pacific ENSO Update is a bulletin of the Pacific El Niño-Southern Oscillation (ENSO) Applications Climate (PEAC) Center. PEAC Center conducts research & produces information products on climate variability related to the ENSO climate cycle in the U.S.-Affiliated Pacific Islands (USAPI). This bulletin is intended to supply information for the benefit of those involved in such climate-sensitive sectors as civil defense, resource management, and developmental planning in the various jurisdictions of the USAPI.

The Pacific ENSO Update is produced quarterly both online and in hard copy, with additional special reports on important changes in ENSO conditions as needed. For more information about this issue please contact the editor, LTJG Charlene Felkley, at peac@noaa.gov or at the address listed below.

PEAC Center is part of the Weather Forecast Office (WFO) Honolulu's mission and roles/responsibilities. All oversight and direction for PEAC Center is provided by the Weather Forecast Office Honolulu in collaboration with the Joint Institute for Marine and Atmospheric Research (JIMAR) at the University of Hawaii. Publication of the Pacific ENSO Update is supported by the National Oceanic and Atmospheric Administration (NOAA), National Weather Service-Pacific Region Climate Services. The views expressed herein are those of the authors and do not necessarily reflect the views of NOAA, any of its sub-agencies, or cooperating organizations.

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